THIS ANNUAL SUMMARY

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PLANT PEST CONTROL DIVISION
COOPERATIVE FOREST PEST ACTION PROGRAM

1975 ANNUAL SUMMARY

This newsletter is a summary of the observations and field work completed during the tenth season of Cooperative Forest Insect and Disease Detection surveys.

GENERAL COMMENTS

The month of January 1975 did have the same warm weather as has been experienced the last four or five years. Therefore, we had some abnormal conditions to report in the early part of the year. The January hatching of the Virginia pine sawfly in previous years has caused the populations to be extremely low and it is now very difficult to find specimens in southern West Virginia.

The Pest Identification Laboratory logged in and answered 636 insect and disease problems in 1975. A total of 438 of these specimens were received during the period May through August. A total of 637 telephone calls requesting assistance or information were received during 1975.

Early summer defoliators seemed to cause most of the defoliation to hardwoods in West Virginia. The spring defoliators were predicted to cause the most damage but populations apparently collapsed and no defoliation was noticed. The late summer defoliators were more abundant this year than in previous years. An oak sawfly is on the increase in southern West Virginia and last year defoliated approximately 45,000 acres of oak in the area around Pipestem. A detailed report is included in the summary.

The Plant Pest Control Division, West Virginia Department of Agriculture, in cooperation with Sandoz, Inc., aerially sprayed 80 acres of hardwoods in Pocahontas County to measure the efficacy of Thuricide 16B on the oak leaftier.

The Asiatic oak weevil is increasing in Pocahontas County and light defoliation was noted in 1975.

FOREST INSECTS

Oak leaf tier - Croesia albicomana. In December of 1974 an egg survey was conducted in the Moorefield, Elkins, Bartow, Marlinton and White Sulphur Springs area to predict the 1975 defoliation and spread of this insect. A total

of twenty plots were checked and it was found the area around Boyer and Seneca State Forest would have moderate defoliation. The other areas would have light or no defoliation. It was predicted that 100,000 acres of oaks would have light to moderate defoliation and an additional 200,000 acres would have light to negligible defoliation.

The results of this survey were made public and Sandoz, Inc., contacted the West Virginia Department of Agriculture regarding the possibilities of applying their product, Thuricide 16B, on the oak leaftier to determine the efficacy of the material in reducing the impact of the oak leaftier.

The following is the data obtained in this test spray:

EVALUATION OF THURICIDE 16B AGAINST THE OAK LEAFTIER IN WEST VIRGINIA

(1) Alan R. Miller and (2) Albert E. Cole

ABSTRACT

A field experiment was conducted in Pocahontas County, West Virginia, to determine the efficacy of Bacillus thuringiensis Berliner (Thuricide 16B) aerially applied at the rate of 1 qt. and 2 qt. AI/acre against the oak leaftier, Croesia albicomana (Clemens). Results of a single aerial application on May 29, 1975, indicate that Thuricide 16B at 2 qt. AI/acre was more effective in reducing oak leaftier larvae populations determined by frass collections than at 1 qt. AI/acre, however, there was no significant difference in the degree of foliage protection. There was a significant difference between the Thuricide treated plots (at both rates) and the non-treated plots in the weight of frass collected following treatment, foliage protection and subsequent black light trap recoveries of adult moths.

INTRODUCTION:

The oak leaftier, Croesia albicomana (Clemens), feeds on various oaks from the southeastern Canada to Minnesota and Texas. Serious outbreaks have occurred in the northeastern and middle Atlantic states in recent years. In 1964 and 1965, approximately a half million acres of red oak were severely defoliated in Pennsylvania (Baker) and since 1966 thousands of acres have been defoliated in West Virginia resulting in considerable tree mortality (Miller, A. R.).

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(2) Director, Plant Pest Control Division, West Virginia Department of Agriculture

The oak leaftier has two impacts on West Virginia's forest lands: (1) recurring spring defoliation results in tree damage and mortality, and (2) sites that were predominately oak, the primary wood-producing species in West Virginia's forest products economy, have reverted to white pine when extensive mortality has occurred. The early defoliation dates have apparently had little effect on the public as the aesthetic values of recreational areas are reduced before most people take to the woods for camping and picnicking.

No insecticide is currently registered for oak leaftier control. In 1974 the Plant Pest Control Division Director, West Virginia Department of Agriculture, arranged with Sandoz, Inc., the producers of Thuricide 16B, to experimentally apply BT on 8 ten acre plots in Pocahontas County to determine the efficacy of the material in reducing the impact of the oak leaftier with one application. The Plant Pest Control Division, West Virginia Department of Agriculture, conducted the spray program and did the monitoring. Sandoz, Inc., supplied the Thuricide 16B and the services of a helicopter from Ag. Rotors, Gettysburg, Pennsylvania.

METHODS AND MATERIALS:

Experimental plots were established in the Seneca State Forest and the Boyer areas of Pocahontas County, West Virginia, where egg counts taken during the winter months indicated that medium to heavy defoliation would occur in the Boyer area and light to medium defoliation would occur in the Seneca State Forest as a result of feeding by Croesia albicomana (Clemens) larvae. In each area two 10 acre plots were sprayed with Thuricide 16B at the rate of 2 qts. AI/acre and two 10 acre plots were sprayed at the rate of 1 qt AI/acre. One control plot was selected in each area. Distances between the plots in each area varied from 100 feet between the different application rates to 3/4 mile between replicates and the two areas were 7 miles apart.

Applications were made with a Bell 47G helicopter equipped with 44, D2-25 hollow cone nozzles. The areas were treated when the oak leaves were 50% developed (May 29) and the oak leaftier larvae were about fully developed.

Data used to evaluate the effectiveness of the Thuricide 16B applications were obtained from 5 frass traps in each plot and from black light collections made in each plot following the treatments. Pre and post spray defoliation estimates were made from the ground and from the air.

Oak leaftier adults were collected in the Boyer plots by using 12 volt battery operated black light traps. Collections were sorted and counted at the South Charleston Lab.

Aerial droplet size and distribution were monitored by using white Kromekote cards at each application site.

A post spray egg mass count will be made in January or February, 1976, to determine probable 1976 population levels in the control and in the treated plots.

RESULTS AND DISCUSSION:

The spray applications were made May 29, 1975, at Boyer and Seneca State Forest, Pocahontas County, West Virginia. The pre-spray defoliation was approximately 50% in the Boyer Area and 10% in the Seneca State Forest Area. Leaf development on the scarlet and red oaks was 50% in the Boyer Area and 75% in the Seneca Area.

The Thuricide 16B at both application rates gave adequate foliage protection in the Boyer Area and was significantly different from the control. The Seneca Area showed no significant difference between the treated and the control plots. Winter egg counts in the Seneca State Forest indicated that there would be light defoliation (25%), however, the actual defoliation was about 5-10%. It is felt the Seneca plots had such low populations that the data collected is of no significance.

The plots in the Boyer Area were divided by a major highway. Two of the plots to be sprayed and the control plot were situated north of the highway and two of the plots were south of the highway. Visual estimates of the defoliation in all of the Boyer plots was 50% on May 29. Two weeks after spraying the plots north of the highway were estimated to be only 10% defoliated while the plots south of the highway were estimated to be 50% to 60% defoliated. The control plot north of the highway was 50% defoliated (Table 1). Upon examination of the plots south of the highway relatively high populations of an oak sawfly, probably Caliroa sp., and the asiatic oak weevil, Cryptepistomus castaneus (Roelofs) were found to be causing additional damage to the oak foliage. These two species could not be found in the plots north of the highway. The quantity of oak leaftier larval frass collected in the Boyer Area was significantly different in the control area and in the plots treated at the 1 qt. AI/acre rate and at the 2 qt. AI/acre rate. The plots treated at the 2 qt. AI/acre rate had 69% less frass than the control plot and 38% less than the plot treated at the 1 qt. AI/acre rate (Table 2).

The plots in the Seneca State Forest area were estimated to be 10% defoliated on May 29, except that the plot already established as the control plot showed no significant degree of defoliation. It was too late to change the control. Two weeks after the BT applications the control plot still showed no defoliation and the plots treated at the 1 qt. and 2 qt. AI/acre rate remained at 10% defoliated (Table 1). Frass collections at the Seneca plots did show a 50% reduction on the plots treated at the 2 qt. AI/acre rate compared to the plots treated at the 1 qt. AI/acre rate (Table 3).

Analysis of the spray cards showed that adequate coverage was achieved in all treatments (Table 4). No problems were encountered in applying either formulation and there was no rain for 24 hours following the treatment date.

Two black light traps were placed in the 2 qt. AI/acre plots and in the control plot in Boyer. Problems with the light trap occurred in the 1 qt. AI/acre plot and adult populations could not be monitored. The trapping data (Table 5) indicates that the area sprayed at the 2 qt. AI/acre rate had a 50% reduction in the number of adult moths compared with the control.

Infra-red photos of the Thuricide 16B treated plots and the control plots were taken in late June. The black and white infra-red failed to show any difference, however, the color infra-red showed that significant foliage protection had been achieved in both the 2 qt. AI/acre and in the 1 qt. AI/acre plots north of the highway as compared to the control plot. The plots south of the highway were affected by other insects and defoliation was obvious until late July.

CONCLUSION:

One application of Thuricide 16B at the rate of 2 qt. AI/acre (8 BIU) applied at the time foliage is 50% developed and oak leaftier larvae are nearly fully developed prevented excessive spring defoliation to host oaks. Economically or esthetically valuable oaks could therefore be protected at minimal cost if Thuricide 16B is federally registered for use against oak leaftier.

TABLE 1

Effect of Treatments on Defoliation
Boyer Area

TREATMENT	PRESPRAY DEFOLIATION	FINAL DEFOLIATION (2 weeks after spray)	NET CHANGE %
Thuricide 16B (8 BIU) *	50%	10%	40%
Thuricide 16B (4 BIU) *	50%	10%	40%
Thuricide 16B (8 BIU)	50%	60%	+10%
Thuricide 16B (4 BIU)	50%	60%	+10%
Control	50%	50%	0

Seneca Area

TREATMENT	PRESPRAY DEFOLIATION	FINAL DEFOLIATION (2 weeks after spray	NET CHANGE %
Thuricide 16B (8 BIU)	10%	10%	0
Thuricide 16B (4 BIU)	10%	10%	0
Thuricide 16B (8 BIU)	10%	10%	0
Thuricide 16B (4 BIU)	10%	10%	0
Control	0	0	0

TABLE 2

Percent Frass reduction and comparison of mean Frass production for 15 days
Boyer Area

TREATMENT	NO. OF APPLICATIONS	% FRASS REDUCTION	MEAN FRASS gms/30 sq. ft.
Thuricide 16B (8 BIU)	1	69%	1.01
Thuricide 16B (4 BIU)	1	38%	2.01
Control			3.23

TABLE 3

Percent Frass reduction between formulations
Seneca Area

TREATMENT	NO. OF APPLICATIONS	% FRASS REDUCTION	MEAN FRASS gms/30 sq. ft.
Thuricide 16B (8 BIU)	1	50%	.868
Thuricide 16B (4 BIU)	1		1.704
Control			.650

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Control	0	0	0

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Control			.650

TABLE 4

Spray droplet size for Thuricide 16B

Boyer Area

FORMULATION	DROPLETS/cm^2	(MICRONS)
Thuricide 16B (8 BIU)	11.2	288
Thuricide 16B (4 BIU)	5.7	253

Seneca Area

FORMULATION	DROPLETS/cm^2	(MICRONS)
Thuricide 16B (8 BIU)	4.8	303
Thuricide 16B (4 BIU)	5.5	285

TABLE 5

Black Light Trapping - Adults caught in 10 day period

Boyer Area

TREATMENT	NO. OF ADULTS CAUGHT	% REDUCTION
Thuricide 16B (8 BIU)	1682	50%
Control	3264	

References Cited

Baker, W. L. Eastern Forest Insects, USDA Misc. Pub. 1175

Miller, A. R. Annual Summaries, Cooperative Forest Pest Action Program, Plant Pest Control Division, West Virginia Department of Agriculture, 1966, 1968, 1970, 1973

APPENDIX

EVALUATION OF PRE AND POST SPRAY EGG COUNTS AFTER APPLICATION OF THURICIDE 16B AGAINST THE OAK LEAFTIER IN WEST VIRGINIA

Alan R. Miller (1) and Phil VanBuskirk (2)

ABSTRACT

Results of the post spray egg counts in January 1976 indicate that Thuricide 16B at the 2 qt/acre and 1/qt per acre rate reduced the oak leaftier populations in the Boyer Area.

There was a significant difference between the thuricide treated plots (at both rates) and the non-treated plots in the weight of frass collected following treatment, foliage protection, black light trapping for adult moths and egg counts.

INTRODUCTION

In December 1974 an egg survey was conducted in Pocahontas County to determine spread and predict defoliation by the Oak leaftier in 1975. Two areas were found to have numerous eggs and would have moderate to light defoliation.

After learning of the proposal to spray with Thuricide 16B these areas were checked more closely for egg counts.

METHODS AND MATERIALS

The survey method was devised by Ciesla (1969) (3). It employed the determination of egg counts on two 15" branch samples on each of four trees per plot. Three sampling areas were randomly selected in each of the spray blocks and the control block. This gave us a sampling on 24 branches in each block.

The egg counts could be classified into three categories:

(1) Negligible to light -- 0-25% defoliation (0 - 8.0 mean eggs per 15 inch branch sample).

(2) Moderate 26-75% defoliation (8.1 - 28.2 mean eggs per 15 inch branch sample).

(3) Heavy 76-100% defoliation (28.3+ mean eggs per 15 inch branch sample).

RESULTS

Egg sampling in the Boyer Area during the winter of 1974 and 1975 were equal in the control blocks and much reduced in the spray block. See Table 6.

The sprayed blocks showed a reduction in egg counts when compared to the control. See Table 6.

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The percent reduction of eggs closely compares to the percent reduction of frass in the 8 BIU plot, however, no significant difference in the 4 BIU plot. The Seneca plot actually decreased in the control plot and it is thought the cyclic nature of this insect is probably the reason.

TABLE 6

Effect of Treatments on Egg Counts

Boyer Area

TREATMENT	PRESPRAY EGG COUNTS AVE 15" BRANCH SAMPLE (AVERAGE FOR ENTIRE AREA)	POST SPRAY EGG COUNTS AVE 15" BRANCH SAMPLE JANUARY 1976	% EGG REDUCTION
Thuricide 16B (8 BIU)	26.7	5.87	77.71%
Thuricide 16B (4 BIU)	26.7	7.50	71.52%
Thuricide 16B (8 BIU)	26.7	8.08	69.32%
Thuricide 16B (4 BIU)	26.7	4.29	83.71
Control	26.7	26.33	0.98

Seneca Area

TREATMENT	PRESPRAY EGG COUNTS AVE 15" BRANCH SAMPLE (AVERAGE FOR ENTIRE AREA)	POST SPRAY EGG COUNTS AVE 15" BRANCH SAMPLE JANUARY 1976	% EGG REDUCTION
Thuricide 16B (8 BIU)	8.5	.94	88.85
Thuricide 16B (4 BIU)	8.5	.63	92.59
Thuricide 16B (8 BIU)	8.5	.19	97.77
Thuricide 16B (4 BIU)	8.5	.63	92.59
Control	8.5	1.44	83.06

(1) Forest Entomologist, Plant Pest Control Division, West Virginia Department of Agriculture
(2) Field Supervisor, Plant Pest Control Division, West Virginia Department of Agriculture
(3) References Cited: Ciesla, W. M. Journal of Economic Entomology 1969 62:1054-1056

PREDICTIONS FOR 1976

Egg surveys for the oak leaftier have been completed for 1976 and it is predicted that moderate defoliation will occur in the Frank, Boyer, and Seneca State Forest Area, over approximately 30,000 acres. Light defoliation will occur in the Back Mountain, Cass, Watoga and Blue Bend Areas covering an additional 100,000 acres.

EASTERN TENT CATERPILLAR - Malacosoma americanum. No outbreaks of this insect are expected for the next few years. This insect is at an all time low in West Virginia.

FOREST TENT CATERPILLAR - Malacosoma disstria. Very few specimens have been submitted to the laboratory and occasional larvae have been spotted in the field. We expect no outbreaks this year in West Virginia.

VIRGINIA PINE SAWFLY - Neodiprion pratti pratti. Populations of this insect have decreased in the past 5 years due to abnormal weather conditions. Since 1971 this insect has hatched in January due to warm weather and then killed by freezing conditions in late January or February. However, in January 1976 we did not experience the warm conditions and the insect will probably start to build up on Southern West Virginia. The insect is causing some damage in Central and Northwestern West Virginia.

THE PERIODICAL CICADA - Magicicada septendicum. The periodical cicada or seventeen year locust will not appear until 1978 in Grant and Pendleton counties when Brood I will emerge. An error was made in our records and we had previously predicted emergence to take place in Central West Virginia during 1978. The Central West Virginia emergence of Brood VIII will occur in 1982.

THE PINE LEAF CHERMID - Pineus pinifoliae. The pine leaf chermid is expected to cause light to moderate damage to white pine and red spruce in the mountainous area of West Virginia.

A LEAF MINING WEEVIL - Odontopus calceatus. This insect is expected to be abundant and will cause noticeable damage to leaves of yellow poplar and sassafrass.

THE LOCUST LEAF MINER, Odontota dorsalis, is expected to cause extensive damage to leaves of black locust throughout the state with the exception of the Allegheny Mountain region. This insect has caused considerable damage to Black locust in West Virginia the last few years.

FALL WEBWORM - Hyphantria cunea. This insect seemed to be in all counties of the state in 1975, but caused little or no damage in most instances. It is expected the insect will cause noticeable defoliation in Preston, Tucker, Mineral, Greenbrier and Hampshire counties.

FALL CANKERWORM - Alsophila pometaria. Surveys conducted in January of 1975 indicated the insect would cause complete defoliation in mid-June to approximately 3000 acres in the Dolly Sods area and 1000 acres in Jefferson County. However, the populations collapsed and defoliation did not occur. When the eggs were collected some were brought to the laboratory and reared to maturity. It was found that 22% of the eggs were parasitized by a small wasp (as of now unidentified) and 20% of the eggs did not hatch for unknown reasons. This would account for a decrease of 42% of the cankerworm larvae. This significant decrease in population certainly points to the reason for the collapse of this insect. The remaining larvae that hatched in the field were probably reduced in numbers by a native predator carabid beetle, Calosoma frigidium.

Tanglefoot barriers to trap adult female moths and egg sampling in the affected areas are continuing and the results for 1976 are as follows: The Mt. Storm Area had an average of 11.0 females per tree and 8 egg masses per 50 twig samples from ten trees. The Mt. Storm Area Plot No. 2, which is South of Mt. Storm, had an average of 12.1 females per tree and 4 egg masses per 50 twig samples from ten trees. The Pigeon Roost fire tower area had 6 egg masses per 50 branch samples from 10 trees.

This data indicates that there will be no noticeable defoliation this year in the Dolly Sods and Mt. Storm areas of Grant County. Aerial flights and ground surveys will be conducted in June to see if these predictions hold true and if the insect has spread to additional areas.

Plans are underway to set up plots in the cankerworm areas and measure growth loss and mortality that may have been caused by the cankerworm.

WALKING STICK - Diapheromera femorata. The first outbreak of this insect occurred in 1973 in Mineral County and it continues to be a problem in isolated areas. A follow-up on the hatching dates of this insect indicate there is one generation per year instead of one generation every two years. Climatic conditions, however, may alter this emergence pattern since West Virginia is considered to be both northern and southern

SOUTHERN PINE BEETLE - Dendroctonus frontalis. Occasional specimens have been submitted to the laboratory and infestations in the field have been noted. The insect has been found in Clay County (new county record) where it has killed numerous Virginia pines.

A summary of mortality caused by the southern pine beetle in 1974 for the entire Southeast shows that 500,000,000 board feet of sawtimber and 1,660,000 cords of timber was lost. This amounts to a value of 43 million dollars.

According to entomologists in some of the southern states, the southern pine beetle has collapsed in many areas during 1975.

GYPSY MOTH - Porthetria dispar. The Gypsy Moth continues to move south and west. In the northeast, gypsy moths defoliated 466,921 acres in seven states. In 1973 the insects defoliated 1,777,406 acres in nine states and in 1974, 750,905 acres in seven states. No defoliation occurred in New Hampshire or Vermont.

The sharp decrease in acres defoliated is attributed to insect virus, control by parasites, and extensive state, federal and private control programs

Twelve male moths were caught in West Virginia this year. All catches were in Jefferson (6 males), Berkeley (4 males), and Morgan (2 males). To date 36 male moths have been caught in West Virginia in 9 counties.

Burlap banding in male moth catch sites will continue this year. These bands are checked throughout the season for larvae, pupae, eggs and other insects that normally occur in each area.

The trapping program this year entailed a 1x1 square mile grid pattern in Morgan, Berkeley, Jefferson and Hampshire counties. A 1x3 square mile grid was used in Mineral, Grant, Hardy, Pendleton, Monongalia, Preston, Tucker, and part of Randolph County.

All state parks, forests, public hunting and fishing areas and Corp of Engineers land was trapped. Department of Natural Resources Service Foresters trapped fifteen western counties. The counties bordering Virginia were trapped on a 1x9 square mile grid pattern.

This year a new deltoid type of trap was used. The cardboard trap came stacked flat and was assembled by folding and stapling. The tack trap was pre-installed and activated by peeling off a protective covering. The bait used was Disparlure.

A total of 4,650 traps were placed in West Virginia this year.

SUMMARY OF 1975
GYPSY MOTH
BIOLOGICAL CONTROL PROGRAM ACTIVITIES
IN WEST VIRGINIA

Charles C. Coffman, Entomologist

Before summarizing this year's activities, I feel it is important to restate the original objectives of the Program to clarify them for interested persons.

When this Program was funded in 1972, the objective was to establish a program to combat the gypsy moth using biological control agents when it moved into the state from the northeast. Since gypsy moth populations were not present then, and still are not as far as is known, the immediate objectives were to establish a mass rearing program for the polyphagous gypsy moth pupal parasite Brachymeria intermedia and attempt to establish this species on alternate native hosts. Furthermore, additional polyphagous gypsy moth parasites were to be acquired from the New Jersey Department of Agriculture's rearing laboratories for release in an attempt to establish them. If successful in establishing these species, more biological pressure would be exerted on gypsy moth populations initially than would otherwise be there, since movement of most gypsy moth parasite populations lags behind gypsy moth advancement by one to several years. Subsequent to initiation of the Program, surveying the native parasite and predator species attacking forest defoliating Lepidoptera became a major objective. Documenting the occurence and, whenever possible, the abundance of these species would contribute to the establishment of an information base, upon which future decisions concerning management of forest pest species could be made.

Continued refinement in rearing techniques enabled laboratory personnel to increase B. intermedia production for the third consecutive year. Total production was 236,276 which more than tripled the 1974 figure. The techniques refinements and an increase in summer help combined to produce this result.

A comparison of selected rearing statistics from our three years of operation is given in Table 1.

Table 1. Summary of selected Brachymeria intermedia rearing statistics 1973-75.

Year	Total Parasites	Monthly % Emergence[1]			% Mortality
		Min.	Mean	Max.	
1973	58,414	6.6	15.8	49.9	7.6
1974	72,982	14.1	30.7	52.6	7.1
1975	236,276	22.2	41.7	61.1	13.3

[1]Calculated from total host cocoons exposed to parasitization, not from pupae actually parasitized.

Our initial effort in 1973 was hampered by two problems. Both pupation inhibition in our host colony (Galleria mellonella, greater wax moth) and host pupal deterioration after parasite oviposition contributed significantly to the poor results obtained by reaching a peak together in August. The same thing happened in 1974 when these problems reoccurred and peaked again in August. However, our efforts to combat these difficulties yielded some improvement and by the 1975 summer season they were almost non-existent. Percent emergence in August 1975 was 46%, compared to the minimums of 6.6% and 14.1% recorded in August 1973 and '74, respectively. The above problems are treated in separate reports available on request from this office. The former in "Galleria mellonella Diet Experimentation" and the latter in "Galleria mellonella Pupal Deterioration After Ovipositing by Brachymeria intermedia". The increase in mortality in 1975 resulted in part from overcrowded cages, while a reduction in strain vigor was also suspected.

After 14 months of rearing the polyphagous pupal parasite Coccygomimus sp., it was dropped from the Program in August. The continuing inability of "infested" states to establish the species on gypsy moth led to this decision. Our experience with Coccygomimus sp. is summarized in Tables 2 and 3. Initially, brief experimentation (Table 2) was conducted to identify a suitable time length for oviposition on G. mellonella. The maximum percent emergence (52.7) was obtained with a two hour exposure time. The number of replicates was not uniform because enough host pupae were not available at the time.

Table 2. Coccygomimus sp. emergence from Galleria mellonella pupae exposed to oviposition for varying lengths of time.

Hours Pupae Exposed to Oviposition	Total Parasites Recovered	Mean% Emergence[1]	Number of Replicates
½	51	32.6	3
1	73	33.8	2
2	432	33.4	10
3	220	33.4	5
4	66	28.1	2
7	17	26.2	1

[1]Calculated from total host cocoons exposed to parasitization, not from pupae actually parasitized.

Subsequent rearing (Table 3) utilized primarily "scrap" pupae from the B. intermedia rearing, so better results would probably have been obtained if stricter quality control of host pupae had been maintained. Coccygomimus sp. was much more sensitive to temperatures above 22°C (75°F) than B. intermedia. This was evident from the high mortality in our labs, which are difficult to maintain below 22°C during the summer.

Table 3. Summary of selected Coccygomimus sp. rearing statistics 1974-75.

Year	Total Parasites	Monthly % Emergence[1] Min.	Mean	Max.	% Mortality
1974	4,776	27.4	30.7	42.6	20.3
1975	5,022	22.2	25.0	40.1	17.1[2]

[1]Calculated from total host cocoons exposed to parasitization, not from pupae actually parasitized.

[2]Does not include January, February, and March when rearing was on a maintenance basis only and mortality figures were not recorded.

Six species of polyphagous parasites were released in 1975. Included were the pupal parasites B. intermedia, Coccygomimus sp., C. instigator, and C. turionellae; the early instar larval parasite, Meteorus pulchricornis; and the late instar larval parasite, Palexorista inconspicua. Potential alternate hosts known to be present in the release areas include: the dark tussock moth, Dasychira basiflava; several other, as yet unidentified, species of lymantriids; a climbing cutworm, Polia latex; a lichen moth, Hypoprepia miniata; the orange-striped oakworm, Anisota senatoria; and numerous species of butterflies including the silverspotted skipper, Epargyreus clarus; a wood nymph, Cercyonis sp.; and a crescent-spot, Phyciòdes sp.

Also released were two other early instar larval parasites, Apanteles liparidis and A. porthetriae, which are considered oligophagous and therefore may be capable of surviving on a restricted range of alternate hosts in the absence of gypsy moth. In personal communication from Paul Shaeffer (Location Leader, USDA, ARS, Asian Parasite Laboratory) to Jack Coulson (Chief, USDA, ARS, Beneficial Insect Introduction Laboratory) in April 1975, Shaeffer stated that "To exist in association with gypsy moth, A. liparidis requires an alternate, overwintering host." He went on to suggest that Dasychira basiflava and D. cinnamomea, which overwinter as larvae, might serve this purpose in Connecticut. Coulson (1976, phone conversation) has since conveyed the information that A. liparidis has been recovered from the pine lappet moth, Dendrolimus pini (Lasiocampidae) in Europe and recently from the lymantriid, Leucoma candida in Japan by Shaeffer. Both A. liparidis and A. porthetriae were released with the knowledge that D. basiflava and other lymantriids were present in the release areas. After the recent phone conversation with Dr. Coulson, a check of our state collection records revealed entries from two non-adjacent counties for the lappet moth, Epicnaptera americana (Lasiocamp-

idae). Also, Baker (1972) states that it is generally distributed, though not necessarily common, through the Eastern states. Therefore, it probably occurs throughout most of the state and would add to the potentially suitable complex of alternate hosts present in the release areas.

All parasite releases are summarized in the Appendix. Detailed release and site information is available on request.

A systematic program for evaluation of parasite releases was conducted throughout June, July, and August for the first time. Methods employed included recovery of potential host larvae and pupae from burlap banded trees, deployment of traps baited with Galleria mellonella pupae, use of two types of Malaise traps, and collection of Croesia albicomana (oak leaftier) pupae for the second consecutive year from an area where B. intermedia had been released the previous two years.

Only 10 trees were burlap banded at each site and the number of potential host larvae and pupae collected was so small that numbers weren't recorded. No released parasites were recovered, but a few native species were. Use of this technique will be expanded in 1976 and should yield better results.

The method of using traps baited with G. mellonella pupae was adopted from the North Carolina Department of Agriculture after they demonstrated its ability to collect the native species Brachymeria ovata. A total of 627 traps containing 10 pupae each was placed in the field between May 28 and August 21. Initially, traps were changed biweekly, but after the second change it was done weekly. Traps were tied in trees from one to approximately 35 feet off the ground, but the majority (95%) was less than 10 feet high. Counties in which traps were placed included Pocahontas, Pendleton, Hardy, Hampshire, Grant, and Kanawha, and each site was a previous release area for B. intermedia. The only parasites recovered from this entire effort were 32 B. ovata specimens taken from a set of 27 traps at the Kanawha County site between June 21 and 29. Modifications in this technique will be introduced next season in an attempt to improve results.

Three Malaise traps were used to collect adult parasites in two release areas. A single trap was used at the Capon Bridge site in Hampshire County from June 5 until July 9 when a second trap was placed in the same area. On July 16 the third trap was set at the Moorefield site in Hardy County. All traps were operated until August 26. Trap #1 was a modified version of the trap produced by Survival Security Corporation, Lake City, Minnesota, and was constructed in our labs. Traps 2 and 3 were of the Townes (1972) type and were on loan from the Forest Service.

The first 16 Malaise trap collections taken were sent to Richard Reardon (USDA, USFS, Entomologist) for sorting and identification in a cooperative effort. The collections were sorted for gypsy moth parasites and native parasitic species in the same families, i.e. Braconidae, etc. No B. intermedia were recovered and neither were any Compsilura concinnata. The latter is an important, broadly polyphagous, gypsy moth larval parasite that is established in infested states and has been found in Virginia and Michigan, but has yet to

be reported from West Virginia. Specimens identified as belonging to genera containing released gypsy moth parasites are listed in Table 4. These specimens are being sent to the U. S. National Museum for species identification.

Table 4. WVDA Malaise trap collections[1], June-August, 1975. The genera Coccygomimus, Apanteles, and Meteorus.

Location	Trap Type	Date	Coccygomimus spp.	Apanteles spp.	Meteorus spp.
Capon Bridge	WVDA	6-12-75		1	
Capon Bridge	WVDA	6-19-75	31	10	
Capon Bridge	WVDA	6-25-75	6	82	1
Capon Bridge	WVDA	7-1-75		44	
Capon Bridge	WVDA	7-9-75		20	
Capon Bridge	WVDA	7-16-75	1	22	
Capon Bridge	USFS	7-16-75	1	16	
Moorefield	USFS	7-23-75		12	1
Capon Bridge	USFS	7-24-75	4	15	
Capon Bridge[2]	WVDA	7-24-75			
Moorefield	USFS	7-30-75	2	7	
Capon Bridge	USFS	7-31-75	4	10	
Capon Bridge	WVDA	7-31-75	2	16	
Capon Bridge	WVDA	8-6-75	3	13	
Capon Bridge	USFS	8-6-75		20	
Moorefield	USFS	8-7-75	1	10	
Total			55	298	2

[1]Sorted and identified by U. S. Forest Service personnal under the direction of Richard Reardon, Entomologist, Gypsy Moth Program.

[2]This collection spoiled.

Sorting, tabulation, and identification of specimens from the last nine Malaise trap collections taken between August 7 and 26 is in progress.

On June 10, Croesia albicomana pupae were collected from four sites within an area near Frank, Pocahontas County, where B. intermedia had been released the previous two years. Pupae were placed in 16 oz. Dixie® cups and held in the lab until emergence was complete. Only native parasites were recovered. These are in the process of being identified. Results, minus species identifications, are given in Table 5.

Table 5. Croesia albicomana (oak leaftier) pupal parasite collection, Frank, Pocahontas County, West Virginia, June 10, 1975.

	Site #1	Site #2	Site #3	Site #4	Total
# Pupae	76	80	106	129	391
# Parasites emerged	3	4	10	5	22
% Successful parasitism	3.9	5.0	9.4	3.9	5.6
# Pupae no emergence	13	20	20	33	86
# Unemerged parasites in latter	1	2	3	6	12
% Mortality accounted for by parasitism	5.3	7.5	12.3	8.5	8.7
Total pupal mortality	16	24	30	38	108
% Pupal mortality	21.1	30.0	28.3	29.5	27.6

An ichneumonid collected at the Moorefield study site on July 30 from under a roofing paper bark flap and believed to be Coccygomimus turionellae has now been identified as C. annulipes, a native species, by R. W. Carlson of the U. S. National Museum.

In a continuing effort to cooperate in regional gypsy moth parasite activities, 6,000 B. intermedia adults reared in our laboratories were shipped to two other states. The Virginia Department of Conservation and Economic Development received 4,000 and the Maryland Department of Agriculture 2,000.

A revised list of "Potential Hosts for Brachymeria intermedia (Nees) within West Virginia" was prepared in April for use in conjunction with parasite release planning.

In support of the computerized "Gypsy Moth Technical Information Support System", a list of keywords, based on our library collection of gypsy moth literature, was prepared for Dr. E. Alan Cameron of Pennsylvania State University.

Cooperation was extended to Mary Reynolds (USDA, ARS), in an April interview concerning the gypsy moth in West Virginia. Topics covered were: (1) the status of gypsy moth in West Virginia, (2) what are state agencies doing about it, (3) the extent of our cooperation with state and federal agencies on a regional basis, and (4) gypsy moth parasite releases in West Virginia since 1972. The information acquired from the interview by Mrs. Reynolds was for inclusion in a comprehensive report on the current federal-state gypsy moth parasite program. Subsequently, an extensive written questionnaire on gypsy moth parasite program activities in West Virginia 1972-75 was completed in early October for Mrs. Reynolds for the same purpose.

Cooperation among "uninfested" states engaged in gypsy moth parasite programs was advanced through participation in a May 6 meeting in Winchester, Virginia. In attendance were representatives of the following agencies: Maryland Department of Agriculture, Virginia Department of Agriculture, Virginia Department of Conservation and Economic Development, North Carolina Department of Agriculture, West Virginia Department of Agriculture, Agricultural Research Service of USDA, and Animal and Plant Health Inspection Service of USDA. Topics discussed were: (1) past parasite releases, particularly in border counties, (2) planned 1975 releases, (3) adult parasite trapping programs, and (4) alternate host selection, biology, and sampling.

References Cited

Baker, W. L. 1972. Eastern Forest Insects. USDA, Forest Service. Miscellaneous Publication No. 1175. 642 pp.

Townes, H. 1972. A light-weight Malaise trap. Entomol. News 83:239-47.

AN OAK SAWFLY - Caliroa quercuscoccineae. This insect caused complete defoliation to approximately 42,000 acres in southern West Virginia. The defoliation extended from Alderson in Greenbrier County to the Virginia line in McDowell County. Pipestem State Park has approximately 2,200 acres defoliated and plans are underway to spray this area next year for control of the insect.

The proposed insecticide is a Thompson Hayward Chemical product known as TH6040, or Dimilin.

Dimilin has been proven to be an effective tool in controlling the Gypsy Moth and is an insect growth regulator that inhibits the formation of the insect's cuticle. The insecticide has little impact on native parasites, predators, or honey bees.

The proposed spray program will be an experimental spray to test the efficacy of Dimilin on the Oak sawfly. All monitoring of the program will be done by the Plant Pest Control Division, West Virginia Department of Agriculture and West Virginia Department of Natural Resources State Park and Forestry Division.

BAGWORM - Thryidopteryx ephemeraformis. This year seemed to be an all time high for defoliation by the bagworm. Ornamental shrubs and evergreens have been completely defoliated throughout the state. Numerous Sycamore trees have been defoliated this year in many areas of the state.

PHEROMONE TRAPPING IN WEST VIRGINIA

The West Virginia Department of Agriculture, Plant Pest Control Division, maintained pheromone traps throughout the state in cooperating with the Ohio Agriculture Research and Development Center at Wooster, Ohio. The pheromone used is designed to catch clearwing moths such as the peach tree borer, lilac borer, rhododendron borer, maple borer, and oak borer.

Numerous adults were caught in West Virginia and the following is a listing of name, county, and numbers caught.

County	Bait	Species	Total
Hampshire	EZ:ZZ (19:1)	2 Synanthedon fatifera 5 Synanthedon scitula (Dogwood borer)	7
	EZ-OH (Pure)	2 Paranthrene tabaniformis	2
Grant	ZZ (Pure)	3 Carmenta corni 1 Sylvora acerni (Maple Callus borer)	4
Wayne	~~ZZ~~:EZ (12:8)	2 Synanthedon scitula (Dogwood borer)	2
Ritchie	EZ:ZZ (1:19)	2 Carmenta bassiformis 14 (Unknown)	16
Jefferson	EZ:ZZ (19:1)	1 Synanthedon scitula (Dogwood borer)	1
Morgan	Farchan ZZ (Pure)	44 Sanninoidea exitiosa 1 Paranthrene simulans 1 Podesesia syringae (Lilac borer)	46
Morgan	EZ (Pure)	7 Synanthedon pictipes (lesser peach tree borer)	7
Berkeley	EZ:ZZ (19:1)	20 Synanthedon pictipes (lesser peach tree borer)	20
Cabell	EZ:ZZ (1:2)	75 Synanthedon scitula (Dogwood borer)	75
Lincoln	EZ:ZZ (1:2)	6 Sanninoidea exitiosa	6

The following is a list of insects that were sent or reported to the Pest Identification Laboratory. Many specimens were submitted to the lab but are not listed here because they are not economically important or are of little concern.

LEAF MINERS

Leaf miners do damage to the plant by the larvae mining between the upper and lower surfaces of the leaf and remove the chlorophyll. The leaves turn brown and make the tree unsightly. Some of the specimens submitted were: Azalea leaf miner; Birch leaf miner; Yellow poplar leaf mining weevil; Locust leaf miner (numerous specimens); Solitary oak leaf miner (very common in Kanawha Valley); Holly leaf miner (common throughout the state).

GALL INSECTS

Gall insects occur on practically every type of plant we encounter. The galls are of various sizes and shapes and they may occur on the leaves, petioles, branches or boles of plants. The structure we call a gall is actually a house or place for the insect to live while in its developing stages. These galls are unsightly and many times cause trees to appear off color and sickly. The gall insects seldom, if ever, cause trees to die. Climatic conditions seem to determine the insect's abundance or absence on plants. The following is a list of some of the gall insects submitted:

The Witch Hazel leaf Gall aphid (heavy damage on 30 acres of yellow birch in Mineral County). Gouty Oak Gall on Red Oak in Mason County, J. Looney; unknown gall on White Oak in Mercer County, R. McBride, and Fayette County, Stanley Moore; the Succulent Oak Gall on Pin Oak in the Kanawha Valley, John Perdue; the Gouty Vein Gall on Maple in Wetzel County, Ed Murriner; the Maple Spindle Gall on Maple in Harrison County, D. Hill, and very common in the Kanawha Valley; the Maple Bladder Gall Mite common on Maple throughout the state. The Hickory Gall Aphid common on Hickory throughout the state.

SCALE INSECTS

One of the common problems encountered on ornamental shrubs, house plants and forest trees are scale insects. These insects are among our most destructive agents that affect plant life. Injury may be caused by the withdrawal of plant juices from the host by large numbers of insects or by their production of galls while feeding. Some of the scale insects submitted to the lab are as follows: Juniper Scale on Juniper, Mineral County, M. Park; the Cottony Maple Scale, very common on Maple throughout Kanawha Valley and fairly common throughout the state. Euonymus Scale on Euonymus common throughout the state. The Oystershell Scale found on Lilac, in Webster County; the Terrapin Scale found on Silver Maple, Kanawha County; the Magnolia Scale abundant on Magnolia in the Kanawha Valley. The Scurfy Scale seems to be the more abundant scale in the state and numerous specimens have been submitted. Seems to be common on fruit trees.

APHIDS

Aphids, like scale insects, cause injury to the host by withdrawing juices or producing galls while feeding. The number of aphid specimens submitted to the lab seems to lead all others in causing problems. Listed are but a few which were submitted. Pine bark Aphid on White Pine, Putnam County;

the Wooly Alder Aphid on Maple, Lewis County, light to moderate populations on Alder in Preston County, L. Butler; Giant Hickory Aphid on Chinese Chestnut in Monroe County; Aphids on Paper Birch, Fayette County.

WEEVILS

The total number of weevil specimens (attacking trees) submitted this year was at an all time low. However, the Asiatic Oak Weevil and the weevils which attack or feed on chestnuts, acorns, and hickory nuts, were at an all time high. From specimens submitted it seems the weevils affecting nut crops were abundant throughout the state.

The White Pine Weevil, Pissodes strobi, found causing heavy damage to ornamental Norway Spruce in Summers County. The Pales Weevil, Hylobius pales, found causing moderate damage to one acre of White Pine in Pendleton County, J. Atkins and H. Wilson.

The Northern Pine Weevil, Pissodes approximatus, found causing damage to White Pine in Pleasants County.

The Asiatic Oak Weevil, Cyrtepistomus castaneus, was found causing moderate defoliation to approximately 1,000 acres of Oak in Pocahontas County. This insect seems to be on the increase throughout the state and numerous specimens have been submitted to the laboratory for identification.

BEETLES

The larger Elm Leaf Beetle, Monocesta coryli, found causing heavy damage to Elms in Grant County, J. Anderson; and heavy damage to one acre of Elms in Ritchie County, J. Szeliga. Reported as causing heavy damage to Elm, Basswood, and Honey Locust throughout Hampshire County, H. A. Smallwood. Reported to be widespread in Mineral County, A. Eskridge and causing light damage.

The Elm Leaf Beetle, Pyrrhalta luteola, reported from Kanawha County, where it was causing light damage to Elms.

The engraver beetles, Ips grandicollis and Pityogenes hopkinsi, found causing death to 150 white pine trees in Tyler County.

An engraver beetle, Pityogenes hopkinsi, found causing moderage damage to white pine in Braxton County, R. Whipkey. Another engraver beetle, Ips pini, caused death to ½ acre of white pine in Jackson County, L. L. Smith.

An ornamental Norway Spruce in Pendleton County was found infested with another engraver beetle, Ips grandicollis. H. R. Wilson.

The southern pine beetle was mentioned earlier in this summary but no definite places or acreages were given. The following is a summary of attack by southern pine beetle in West Virginia.

SOUTHERN PINE BEETLE - Dendroctonus frontalis. Found causing death to 10 acres of a 30 year old plantation of Red and Virginia pine in Webster County. Mayford Lake.

Found causing death to 2 Red pine trees at 4-H Camp in Upshur County. Jim Mitchell.

Approximately 60 acres of scattered Virginia pine at Lake Lynn in Wayne County have been killed by the beetle.

Specimens submitted from Cabell County where they were causing death of Scotch pine. J. Lewis.

Specimens submitted from Clay County where they were causing death to Virginia pine. Greg Winfree.

Found causing death to 14 Red pine trees in Raleigh County. R. Clark.

SAWFLIES

A sawfly, Macremphytus sp., was found causing damage to leaves of dogwood in Cabell County. R. Radspinner.

A dusky birch sawfly, Croesus latitarsus, found causing damage to leaves of White birch in Cabell County. Betty Burks.

An Oak sawfly, Caliroa quercuscoccineae, submitted from Greenbrier County, J. Circle; Kanawha County; Logan County, Larry Six.

The red-headed pine sawfly, Neodiprion lecontei, found causing damage to Red pine in Raleigh County. R. Clark. Found causing damage to 1 acre of Scotch pine in Berkeley County, Dave Sirna; found on Scotch pine in Monroe County.

The white pine sawfly, Neodiprion pinetum, causing moderate damage to White pine in Mercer County.

The mountain-ash sawfly, Pristiphora geniculata, found on Mountain ash in Randolph County and causing 20% damage to Mountain ash in the Dolly Sods area of Grant and Tucker counties.

The following additional insects were submitted:

The round-headed apple borer, Saperda condada, collected from Black light trap in Pocahontas County.

The Rhododendron borer, Ramosia rhododendri, submitted from Kanawha County.

The Red humped caterpillar, Schizura concinna, collected from apple and peach trees in Kanawha County.

The Pitch twig moth, Petrova comstockiana, collected from Scotch pine, Mineral County, D. Eskridge, and from Scotch and White pine in Jackson County, L. L. Smith.

Many specimens and reports have been received of shoot moths injuring pines throughout the state. This seems to be an all time high for the shoot moths in West Virginia.

The Nantucket pine tip moth, Rhyacionia frustrana, found on Scotch and Virginia pine in Jackson County. This insect has caused heavy damage to plantation of Scotch pine in Mason County and heavy damage to Scotch and Red pine at the State Forest Tree Nursery at Lakin in Mason County.

A Rhyacionia sp. found causing heavy damage to one acre of Scotch pine in Morgan County.

The Hickory tussock moth, Halisidota caryae, submitted from Cabell and Braxton Counties. Little or no damage to the trees.

The Rusty tussock moth, Notolophus antiqua, found causing heavy damage to redbud in Hampshire County, H. A. Smallwood.

The spotted tussock moth, Halisidota maculata, found causing light damage to oaks along I-64 in Putnam County, L. Grayson.

The orange-striped oakworm, Anisota senatoria, causing light damage to oaks throughout Mineral County, M. Park.

The variable oak leaf caterpillar, Heterocampa manteo, found causing light damage to oaks along I-64 in Putnam County, L. Grayson.

The locust twig borer, Ecdytolopha insiticiana, found causing light damage to 5 acres of Black locust in Mineral County, M. Park.

The Maple trumpet skeletonizer, Epinotia aceriella, found causing heavy damage to ornamental sugar maple in Monroe County, J. Circle.

A Notodontidae, Datana major, submitted from Lewis County, where it was feeding on tame azalea, R. Fowler.

The buck moth, Hemileuca maia, reported causing light damage to oaks in Mineral County, D. Eskridge.

PATHOLOGY SECTION

WILT DISEASES

Dutch Elm Disease - Ceratocystis ulmi

Observations in 1975 indicate that the intensification of this pathogen noted in the past three years continues. Dying trees were observed or reported from all major drainage systems in the state. One elm on the State Capitol grounds died in 1975 as a result of DED infection. Without sanitation and removal of diseased trees, others will likely follow.

Elm, while not a major street tree as in other areas, fits a very useful niche in West Virginia. Stream banks show very dramatic soil erosion problems where elms have died. The same can be said of other "weed trees" as sycamore and boxelder.

Verticillium Wilt - Verticillium albo-atrum

This wilt disease continues to be a major tree killer in ornamental situations. Most infections have been in maple. However, yellow-poplar, catalpa, elm and other species have also been observed to have this disease.

Oak Wilt - Ceratocystis fagacearum

OAK WILT DETECTION AND CONTROL PROGRAM

The 1975 Oak Wilt Detection and Control Program was initiated on June 2, and terminated October 10, 1975. The season produced a total of 1,748 diseased trees in 1,198 infected centers. This compares with 2,111 diseased trees in 1,568 infection centers in 1974 or a decrease of 363 trees and 454 infection centers. The 1975 totals include 634 diseased trees located in 348 previously treated centers (Breakovers) and 1,114 trees in 850 centers located for the first time in 1975.

The infection centers were located in 27 of our state's counties. Red, Black and Scarlet Oaks comprised 95.5% of the trees treated. The remainder were white oaks 1.3%, chestnut 3.0%, and scrub oaks 0.2%.

A total of 2,277 man-days were worked on the ground and 1,634 hours and 52 minutes were flown on aerial survey.

APPENDIX

1975 GYPSY MOTH PARASITE RELEASES IN WEST VIRGINIA - COUNTY TOTALS

	Species							
County	Brachymeria intermedia	Coccygomimus sp.	Coccygomimus instigator	Coccygomimus turionellae	Apanteles liparidis	Apanteles porthe-triae	Meteorus pulchri-cornis	Palexorista inconspicua
Berkeley	2,000							
Grant	3,000							
Hampshire	70,000	1,146	112	455	1,141	250	388	368
Hardy	33,000	550		200	1,000	494	222	383
Jefferson	2,000							
Kanawha	329	60						
Pendleton	19,100							
Pocahontas	6,000							
Total	135,429	1,756	112	655	2,141	744	610	751

RESEARCH

As an outgrowth of the pilot project, work was carried out on the Keyser quadrangle for the control of the Oak Wilt disease.

Trees on this quad were injected with Tordon 155 (T-155), Velpar (VP), Potassium Iodide (KI), Diesel Fuel spray (DF) and injection, Pentachlorophenol (Penta), and Formaldehyde (F).

The survival of Ceratocystis fagacearum in naturally infected red and black oaks was determined by culture approximately three and eight weeks after pressure-injection treatment. Isolation from twelve diseased trees/treatments were randomly made above and below the point of injection. Percentage recovery of C. fagacearum from 366 bolewood samples (28/tree), taken three weeks after injection was 36% (DF), 19% (VP), 13% (T-155), 10% (Penta), 10% (KI), and 8% (F). Eight weeks after treatment successful recovery was made from only VP (10%) and Penta (4%) injected trees. Non-injected controls yielded positive cultures 45% and 12% of the time at the first and second collection periods. Pressure-injected chemicals that successfully eliminate diseased trees as an inoculum source may reduce root graft and vector spread of oak wilt. The incidence of new infections will be monitored in treated and non-treated areas.

RUST DISEASES

White Pine Blister Rust - Cronartium ribicola

White pine blister rust control records indicate for the year 1975, 21,089 gooseberry and currant plants were destroyed on 1,425 acres requiring suppression activities. However, two-thirds of the total Ribes destroyed were found on three "hot-spot" square-mile grids.

In addition to direct control activities, 58,435 acres were surveyed in pre-suppression activities and pine area evaluations were made on 1,300 acres. One hundred and ten acres of pine were added to the records as well as seventy-seven acres of control. Discarded acreage figures indicate that 134 acres of pine and 250 acres of control area were dropped. 89,668 acres of control area were placed in the "No further work" category.

The status of control for West Virginia shows that we have 226,826 acres of white pine located within 113,195 acres of control area. Of this total, 410,235 acres are on maintenance which includes 208,523 acres in the "No further work" category. Only 2,930 acres show blister rust activity severe enough to not be placed on maintenance.

Pine to Pine Gall Rust - Peridermium harknessii

We have observed galled Scot's pine in a number of counties including: Pocahontas, Tucker, Mercer, Morgan and Grant counties. To date, however, we have not made laboratory observations to confirm that these are, indeed, this disease and not Eastern Gall Rust.

However, the galling is more characteristic of the pine to pine rust. This disease would be another control problem in Christmas tree production.

CANKER DISEASES

American Chestnut - Chestnut Blight - Endothia parasitica

Work on American Chestnut progressed at a good rate in 1975. Our number of known trees that have good size and resistance characters has now reached more ~~than twenty five.~~ This number is increasing rapidly and should be higher due to the responses (more than 65) that resulted from an article in "Wonderful West Virginia". We are now evaluating each of these reports.

Nut collections were the best to date. Several of the resistant trees yielded from a few to several hundred nuts. These are being held in cold storage and will be planted in the Braxton County nursery site in early spring.

We tried pollination assistance using bee colonies in two instances on trees isolated from another pollen source. This technique will not be used in future years because of the poor results.

Bruce Given is developing a finer touch for grafting chestnut and work along this avenue will be greatly increased in 1976.

We are presently at a crossroads with this work. Without funding assistance further development will be limited. Funding is becoming more of a possibility through the efforts of many people, including, Senator Carl Gainer from Nicholas County.

Black Knot of Cherry - Dibotryon morbosum

There are a number of questions concerning this disease and its affect on individual trees, as well as the affect of slope, aspect, etc., on infection. Plans have been made to try to answer some of the management problems in cherry stands caused by this disease. The work will be done in early 1976.

ROOT ROTS

Cylindrocladium Root Rot - Cylindrocladium sp.

In 1975 this disease caused moderate to severe production problems in both state tree nurseries. Among these are: increased costs for fumigants --

some fumigation work involves using up to 700 pounds of methyl bromide per acre; increased costs for over-seeding to compensate for losses in the seed bed; and increased grading costs.

White Pine Root Decline - Verticicladiella procera

This disease again caused considerable loss in all plantations in which it is known to occur. New areas of infection seemed to be less numerous than in past years.

Growers in Virginia, Pennsylvania, and Ohio, reported problems with this disease in their respective states in 1975.

We have begun looking for the spread mechanism both between trees in an infected stand and also between stands. The organism produces great quantities of spores but most of the production area is underground. Work in 1976 will concentrate on possible insect vectors for the fungus.

DECAY STUDIES

Plans have been made to study the influence of fire and old fire scars on the development of decay in West Virginia. It is hoped that any data that can be generated will be useful in two respects.

First, we want to determine if damage formulas generated by the U. S. Forest Service in the mid-west are applicable and whether we can use or modify this approach to better estimate the cost of fire to timber production.

Second, we hope to generate useful data for use in fire education programs to better inform the public on the actual cost of forest fires.

LEAF DISEASES

Anthracnose - Gloeosporium quercinum

Anthracnose of oak in the Kanawha River Valley received the most landowner attention and question of any leaf disease this summer. We received numerous calls for assistance. Chestnut oak was the most affected species.

Sycamore anthracnose for the first time in several years was of low intensity in West Virginia.

Leaf Blister - Taphrina coerulescens

This disease also caused much leaf spotting and defoliation in the southern half of the state on oak.

Actinopelte Leaf Spot - Actinopelte dryina

Leaf spotting on pin oak caused by this organism was also severe.

Apple Scab - Venturia inaequalis

Unsprayed apple and crabapple trees used for ornamental purposes were heavily diseased and many suffered premature defoliation due to this disease.

Arborvitae Leaf Blight - Fabrella thujina

This disease of ornamental arborvitae has increased statewide the last two years.

At least one nursery was required to spray several blocks to protect the foliage of salable plants.

Leaf Blotch of Buckeye - Guignardi aesculi

Again, during this past August, as in former years, this disease defoliated the entire population of buckeye in West Virginia.

Lophodermium Needlecast - Lophodermium pinastri

Following two years of less than adequate infection weather in July, August, and September, 1975, conditions appeared to be excellent for infection. Severity of the disease can be rated in the spring of 1976 and should be high.

Even though there appears to be greater resistance in other strains of Scot's pine, growers are staying with the French and Spanish strains for Christmas tree production. They, in effect, are saying that it is cheaper to spray than to sacrifice tree quality factors such as color, branching character, and bole straightness.

Swiss Needlecast - Phaeocryptopus gaumanni

This disease of Douglas-Fir was reported for the first time in West Virginia in a stand in Mineral County. Severe defoliation of five acres of a plantation had occurred.

Follow-up surveys of other plantations will be made in early Spring, 1976.

Symptoms include defoliation and browned needles with rows of black perithecia on the undersides of the needles.

Spruce Needlecast - Rhizosphaera kalkhoffii

Several observations, reports, and submitted specimens lead us to believe that this disease of blue spruce is fast reaching economic proportions. This appears to be the second year of the intensified occurrance.

Identifying characters associated with the browning and defoliation is the presence of small, round, black pycnidia that occur at stomatal openings. Pycnidia are more commonly found on fallen needles.

PHYSIOLOGICAL PROBLEMS

Salt Injury

Again, as in former years, salt injury was quite pronounced on many species of roadside vegetation. Maple species appear to be the most sensitive hardwoods. Pines and hemlock also show severe leaf scorch symptoms.

Improper Pesticide Usage

Several times each year, damage to woody vegetation through the use of various pesticides is brought to our attention. Usually damage is the result of herbicides. However, other pesticides will also injure certain plant species. The table below lists several chemicals and the plant species that have shown phytotoxic effects.

PESTICIDE	PHYTOTOXIC TO
Carbaryl (Sevin)	Boston Ivy
Demeton (Systox)	Bechtel's Flowering Crab
Malathion	Juniper (sargeant, burki, and cannaerti)
	Viburnum, Prince George Crab, Ilex rotunda and Talisman and Caledona Roses
Meta-Systox R	English Ivy, Washington Hawthorne
Sulfur	Virburnum, Forsythia
Diazinon	Ferns, Hibiscus
Oil	Hemlock, Boxwood, Redbud, Magnolia, Mt. Ash, Black Walnut, Maple (Red, Sugar, Japanese)
Benzene hexachloride (BHC)	Birch, Apple
Tedion	Rose (some varieties)

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Overpruning

Quite frequently we see valuable shade trees that must be removed because of past pruning practices. Generally these trees incur broken limbs and forks due to extensive heart rot that develops following the "de-horning".

In contacts with tree-owners, foresters should stress the implications of severe pruning and the resultant opening of the tree to decay organisms.

Leaf Scorch

This physiological problem was particularly severe this past summer. Hickory and maple were the two most affected species.

AIR POLLUTION

Ozone plots

Growth data and other character data was again collected on selected Eastern White Pine trees in the native range in Pocahontas and Greenbrier counties. Sixty trees have been rated in four vigor classes since 1971. To date, eleven trees (18.3%) have succumbed to the disease. However, ten trees (16.7%) were originally rated in the number four (worst) class.

Fully two-thirds of this group have died in only four years. The table below shows the changes from the original rating. This data gives indications that those trees prone to ozone injury cannot compete and thus will drop out of the stands.

ORIGINAL CLASS	CHANGE AFTER 4 YEARS				
1	1-1 11 trees	1-2 1 tree	1-3 2 trees	1 tree missing	
2	2-1 3 trees	2-2 8 trees	2-3 3 trees	2-4 1 tree	
3	3-1 0 trees	3-2 6 trees	3-3 0 trees	3-4 8 trees	Dead 1 tree
4	4-2 2 trees	4-3 1 tree	4-4 2 trees		Dead 10 trees

Other Air Pollution Problems

Fluoride injury to a number of tree species near Moundsville was noted during the growing season as has been noticed in previous years. Pine species, apple and beech were among species with symptoms.

A rather extensive survey of air pollution injury to vegetation was made in the Tucker and Grant County area as well as Garrett County, Maryland. Heavy vegetation injury is still occurring in the area east of the Stony River Power Station. Moderate damage was found in several other directions but extended most in the north and northeast directions. Those areas examined west or south of the site and not within direct influence of the plant were free of visible injury.

The "long-short needle syndrome" of Scot's pine publicized in the early 1970's, is still very evident in some plantations, while other stands located nearby are free.

PEST IDENTIFICATION LABORATORY

Listed below are the identification findings of the lab on forest and ornamental specimens examined in 1975.

OAK		
Anthracnose	Gnomonia quercina Gnomonia venata Gloeosporium quercinum	11
Chlorosis		2
Leaf Spot	Actinopelte dryina	2
Twig Blight	Physalospora glandicola	2
Eastern Gall Rust	Cronartium quercium	1
Twig Canker	Dothiorella quercina	1
White Root Rot	Polyperus dryadeus	1
Decline		1
Twig Blighting		1
MAPLE		
Verticillium wilt	Verticillium albo-atrum	9
Leaf Spot	Phyllosticta minima	5
Bull's Eye Spot	Cristulariella pyramidalis	4
Anthracnose	Gloeosporium apocryptum	1
Leaf Spot	Venturia acerina	1
WHITE PINE		
Root Decline	Verticicladiella procera	4
Semimature Needle Blight		1
TAXUS		
Twig Browning		1
Physiological Decline		3
PRUNUS		
Black Knot	Dibrotryon morbosum	3
Peach Leaf Curl	Taphrina deformans	2
Cherry Leaf Spot	Corromyces hiemalis	1
Peach Brown Rot	Monilinia fructicola	2
Cytospora Canker	Valsa leucostoma	1
Peach Bacterial Spot	Xanthomonas pruni	1
Fruit Rot	Phytophthora cactorum	1

MALUS		
Powdery Mildew	Podosphaera leucothrichia	2
Apple Scab	Venturia inaequalis	9
Pear Scab	Venturia pyrina	2
Apple Silver Leaf	Stereum purpureum	1
DOGWOOD		
Flower & Leaf Blight	Botrytis cinerea	1
Crown Canker	Phytophthora cactorum	1
Leaf Spot	Septoria cornicola	2
Twig Blight	Botryosphaeria dothidea	2
Spot Anthracnose	Elsinoe corni	1
SYCAMORE		
Anthracnose	Gnomonia platani	1
WALNUT		
Brown Leaf Spot	Gnomonia leptostyla	1
Decline		1
ARBORVITAE		
Leaf Blight	Fabrella thujina	2
JUNIPER		
Phomopsis Twig Blight	Phomopsis juniperovora	6
ELM		
Dutch Elm Disease	Ceratocystis ulmi	3
ASH		
Dieback		1
SPRUCE		
Needlecast	Rhizosphaera kalkhoffii	6
Canker	Cytospora kunzei f. piceae	1
Decline		2
LOCUST		
Black Root Rot	Cylindrocladium sp.	1